

## 3-D Nanofilm Primary Li Air Battery, Phase I

Completed Technology Project (2011 - 2011)



## Project Introduction

NASA requires a new primary battery capable of providing specific energy exceeding 2000Wh/kg over an operating temperature range of 0

o

C to 35

o

C with a shelf life exceeding 2 years in support of Exploration Medical Capabilities. Metal/air chemistries such as aluminum/air or lithium/air are suggested due to their high theoretical specific capacity. Recent attempts by others at Li-air batteries have provided limited energy and unacceptably poor rate performance due to their use of composite air cathodes. Such composites combine sub-optimal micro-porous powder with low-surface area, poorly distributed, un-optimized electro-catalyst and non-electrochemically contributing binder. Ionova Technologies, Inc. proposes a new Li-air battery utilizing a binderless 3-D nanofilm air cathode comprising a networked mesoporous carbon structure decorated with novel, highly reactive, ultra-high surface area catalysts. Pore size/structure and catalyst distribution are optimized to promote oxygen diffusion and to reduce pore clogging from reaction products while maximizing reaction sites to increase capacity and current density. The proposed electro-catalyst exhibits specific capacity that exceeds what has been demonstrated by other catalyst materials in the research literature. Cumulatively, the 3-D nanofilm Li-air approach is anticipated to improve energy and power densities vs. other approaches by improving discharge capacity and current density. This project will investigate the feasibility of the 3-D nanofilm approach to improve diffusion and reaction kinetics in a primary Li-air battery through modeling and materials/lab cell characterization to TRL3. TRL4 will be achieved by mid-phase II and TRL6 will be achieved by end phase II.



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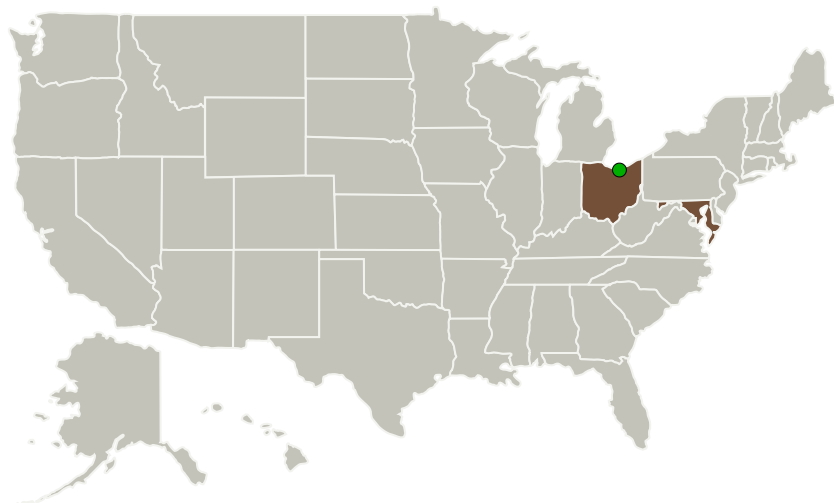
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## Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Ionova Technologies, Inc.	Lead Organization	Industry	Frederick, Maryland
● Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

Primary U.S. Work Locations	
Maryland	Ohio

## Project Transitions

▶ **February 2011:** Project Start

✓ **September 2011:** Closed out

## Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/137797>)

## Organizational Responsibility

## Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

## Lead Organization:

Ionova Technologies, Inc.

## Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

## Project Management

## Program Director:

Jason L Kessler

## Program Manager:

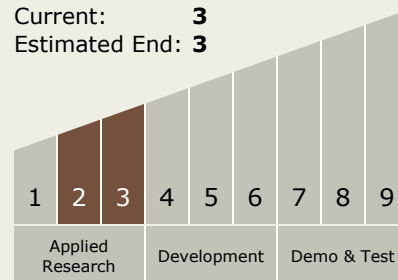
Carlos Torrez

## Principal Investigator:

Fraser Seymour

## Technology Maturity (TRL)

Start: **2**  
Current: **3**  
Estimated End: **3**



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### Technology Areas

#### Primary:

- TX03 Aerospace Power and Energy Storage
  - └ TX03.2 Energy Storage
    - └ TX03.2.1 Electrochemical: Batteries

### Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System